Strategic Alignment Between Business and Information Technology: A Knowledge-Based View of Behaviors, Outcome, and Consequences

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ABSTRACT: Senior executives continue to be concerned about factors influencing the business effect of information technology (IT). Prior research has argued that business–IT strategic alignment facilitates business effect of IT and that contextual factors affect business–IT alignment. However, the role of knowledge considerations in the relationship between contextual factors and alignment, and the role of IT projects in the relationship between alignment and business effects of IT, have not been explicitly examined. Therefore, this paper pursues the following two research questions: (1) Based on knowledge considerations, how do planning behaviors (specifically, IT managers' participation in business planning and business managers' participation in IT planning) and top management knowledge of IT mediate the effects of two

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contextual factors—organizational emphasis on knowledge management and centralization of IT decisions—on business–IT strategic alignment? (2) How do aspects of IT projects (specifically, quality of IT project planning and implementation problems in IT projects) mediate the relationship between business–IT strategic alignment and business effects of IT?

Results from a survey of 274 senior information officers indicate that organizational emphasis on knowledge management and centralization of IT decisions affect top managers' knowledge of IT, which facilitates business managers' participation in strategic IT planning and IT managers' participation in business planning, and both of these planning behaviors affect business–IT strategic alignment. Moreover, the results indicate that quality of IT project planning and implementation problems in IT projects mediate the relationship between business–IT strategic alignment and business effect of IT. These findings highlight the importance of considering the planning and implementation of IT projects when examining the effects of business–IT strategic alignment, and highlight the importance of considering shared domain knowledge (i.e., top managers' knowledge of IT) and planning behaviors when examining the effects of contextual factors on business–IT strategic alignment. Managers can use these results to develop more comprehensive action plans for achieving greater business–IT strategic alignment, and for translating alignment into enhanced IT effects on business performance.

Key words and phrases: business effect of information technology, business–IT strategic alignment, information technology planning, IT project planning, knowledge management.

Senior business executives consider investments in information technology (IT) as potentially strategic to business success [19]. Research in information systems (IS) suggests that achieving strategic alignment between business and IT is essential to improving organizational performance [80, 81, 84]. Due to the increasingly strategic role of IT, resource constraints, and enhanced need for integration of new and existing systems, strategic management of IT has continued to receive attention from researchers and managers [45]. However, despite the considerable prior research on strategic IT management, two major issues remain.

First, there is insufficient understanding of the relationships among contextual factors, planning behaviors, and business–IT strategic alignment. Although prior literature has examined the effects of contextual factors on IT planning behaviors [46, 74, 91] and the effects of contextual factors on the alignment between business and IT strategies [80, 84], research connecting these aspects seems to be lacking. To address this issue, we draw upon the knowledge-based theory of the firm [33, 34, 52, 93] to develop a comprehensive model of how two important contextual factors (organizational emphasis on knowledge management and centralization of IT decisions) affect business–IT strategic alignment through effects on top management knowledge of IT and planning behaviors.

Second, questions have been raised regarding the way in which business–IT strategic alignment facilitates business effect of IT. Seeking to examine the "how" of the alignment–performance phenomenon, we evaluate the planning and implementation of IT projects as mediating the relationship between business–IT strategic alignment and business effect of IT. Although prior literature has not empirically examined such a mediating role of IT projects, this approach is consistent with the prior arguments that business–IT strategic alignment facilitates systems integration and prioritization of IT projects [97], and that IT projects help convert strategic IT plans into systems and products [23].

This paper contributes to the literature on strategic IT management by pursuing the following two research questions:

1. Based on knowledge considerations, how do planning behaviors (specifically, IT managers' participation in business planning and business managers' participation in IT planning) and top-management knowledge of IT mediate the effects of two contextual factors—organizational emphasis on knowledge management and centralization of IT decisions on business–IT strategic alignment?
2. How do aspects of IT projects (specifically, quality of IT project planning and implementation problems in IT projects) mediate the relationship between business–IT strategic alignment and business effects of IT?

Theoretical Development

IT Planning and Strategic Alignment Between Business and IT

The importance of IT planning has been recognized for a long time, but much of the initial focus was on operational issues. Early IT planning literature focused on the application development portfolio [8, 58] and planning for individual IT projects [28]. Blumenthal conceptualized the objectives of IT planning as encompassing "the review of proposed systems in terms of the criteria designed to minimize the number of systems, to broaden their scope, and to place them in the proper sequence for development" [8, p. 13]. Similarly, Ein-Dor and Segev viewed IT planning as including "the development strategy, the purpose of the system, priorities for choosing system functions, system functions (applications), function goals, function requirements, and documentation" [28, p. 1631]. As IT's contributions to organizations progressed from the eras of data processing and management IS to the "strategic" era [103], the objectives of IT planning broadened from IT project planning to supporting and shaping the business strategy [32].

Two aspects of IT planning may thus be identified—strategic alignment between business and IT and IT project planning. Although both of these aspects are recognized as important [26, 97], recent research has concentrated on the first aspect, even when assessing the effects of business–IT strategic alignment. Some of the research on the consequences of strategic alignment between business and IT has directly examined the effects on firm performance [84] without examining the likely intervening effects. Some other studies have focused on other outcomes of strategic IT planning, such as the fulfillment of strategic IT planning objectives [77], strategic IT planning effectiveness [74, 90], and planner satisfaction [30], without linking them to business effects. Thus, little attention has been given to the ways in which business–IT strategic alignment gets converted into superior systems or products that subsequently have business effects [26]. To address this limitation, this paper incorporates IT projects as mediating the relationship between business–IT strategic alignment and business effects of IT.

Some of the prior research on strategic alignment has focused on the alignment between business and IT strategies as the *outcome* of strategic integration between business and IT and examined how this alignment affects dependent variables such as firm performance [84]. Some other articles on strategic alignment between business and IT have examined *behaviors* associated with strategic alignment, such as communication between business and IT executives [80, 81] and the linkage between business and IT planning processes [98]. In addition, some articles have examined the *enablers* of alignment, with top managers' knowledge of IT being the most prominent such factor [54, 101]. However, a theoretical and empirical investigation of the relationships among enablers, behaviors, and alignment has not been conducted. This paper addresses this limitation by drawing upon the knowledge-based theory of the firm to develop a model of alignment between business and IT.

Knowledge-Based Theory of the Firm

The resource-based view of the firm conceptualizes a firm as a bundle of resources and considers it as the basis for a firm's competitive position [104]. Building on the resource-based view, the knowledge-based theory of the firm considers knowledge as a distinctively unique resource [52] and views "the firm as a dynamic, evolving, quasi-autonomous system of knowledge production and utilization" [93, p. 59].

Knowledge integration is a focal aspect of the knowledge-based theory of the firm. Indeed, the knowledge-based theory of the firm suggests that the primary reason for the existence of the firm is its superior ability to integrate multiple knowledge streams, for the application of existing knowledge to tasks as well as for the creation of new knowledge [33, 34]. Regarding the knowledge-based theory of the firm, Grant states, "At the heart of this theory is the idea that the primary role of the firm, and the essence of organizational capability, is the integration of knowledge" [33, p. 375]. The need for knowledge integration derives from specialization and bounded rationality, which leads to individuals being largely ignorant about others' areas of specialization [52] coupled with the reliance of most organizational tasks and innovations on more than one form of specialized knowledge [33, 93].

The literature on knowledge integration distinguishes between "knowledge integration processes" and "knowledge integration." Knowledge integration refers to the outcomes of that knowledge being shared, applied, or combined with other knowledge to create new knowledge [33, 34, 70]. Knowledge integration—which, for clarity, may be labeled as *knowledge integration outcome*—is thus distinct from *knowledge integration processes,*[1] which are the actions through which individuals apply or share specific knowledge or combine it to develop new knowledge.

> [T]he knowledge integration process involves the actions of group members by which they share their individual knowledge within the group and combine it to create new knowledge. By contrast, knowledge integration is the outcome of these processes, consisting of both the shared knowledge of individuals and the combined knowledge that emerges from their interactions. [70, p. 371]

A number of knowledge management processes and mechanisms can be used to facilitate knowledge integration across business and IT. This paper focuses on two processes that have received the greatest emphasis—IT managers' participation in business planning and business managers' participation in strategic IT planning [45].

Successful knowledge integration requires that the concerned individuals possess an underlying base of shared domain knowledge [65, 80, 81], common knowledge [33, 34], or mutual knowledge [21]. When one specialist (e.g., an IT executive) shares certain unique knowledge with another individual (e.g., a business manager), the recipient requires an underlying base of mutual knowledge with the sender in order to comprehend and assimilate that knowledge. Shared domain knowledge or common knowledge helps to create in the recipient the "absorptive capacity" [18] needed to receive the new knowledge, thereby enabling individuals to integrate aspects of knowledge that are not common among them [33, 34]. Managers' knowledge of IT helps to "leverage the knowledge of others" [6, p. 159]. Thus, knowledge context may be argued to facilitate sharing of domain knowledge (the knowledge integration process), which, in turn, affects knowledge integration outcomes. This is depicted in the top part of Figure 1.

Knowledge-Based View of Strategic Alignment

Within the context of strategic IT planning, knowledge integration relates to the integration of business and IT knowledge. An important outcome of this knowledge integration is greater linkage of the strategic IT plan to the business goals and objectives (strategic alignment). This construct, which we call *business–IT strategic alignment,* thus relates to alignment between business and IT strategies [80, 81, 84], with the focus being on the extent to which the strategic IT plan is aligned with the business strategy. This is consistent with recommendations on explicitly considering the organization's business strategy in IT plans [17].

Knowledge integration processes or behaviors facilitate knowledge integration outcomes, as discussed above. In the context of strategic IT planning, two kinds of behaviors related to business–IT knowledge integration have been highlighted—business managers' participation in strategic IT planning and IT managers' participation in business planning [74]. These processes facilitate knowledge integration across business and IT managers by enabling socialization [66], which integrates knowledge through joint activities, such as working together in the same environment [67], as well as exchange, which is the communication or transfer of explicit knowledge between individuals [33]. Participation of business managers in strategic IT planning and participation of IT managers in business planning create "cross-function interfaces" [18, p. 134],

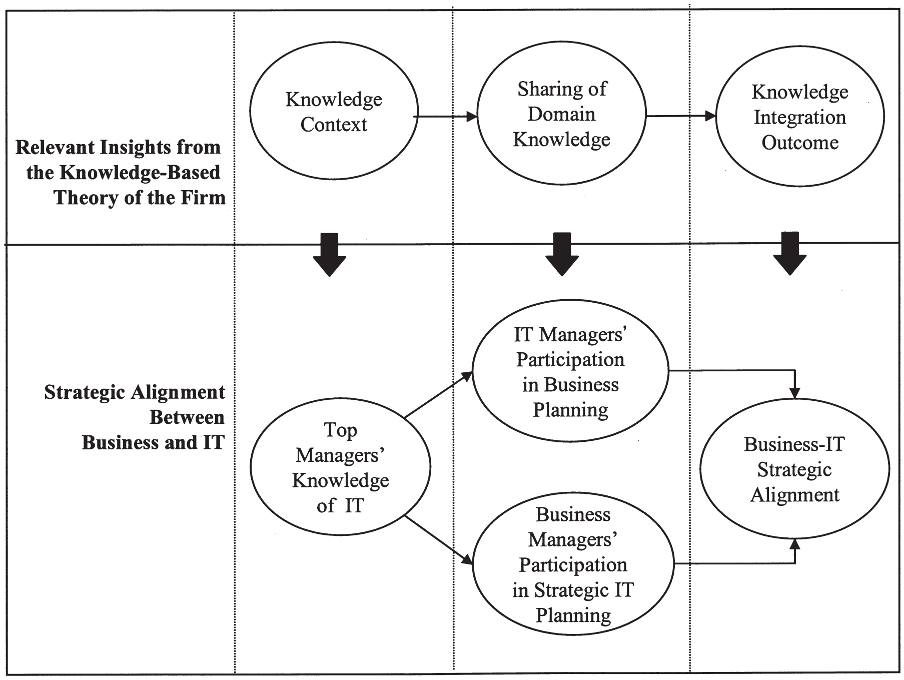

Figure 1. A Knowledge-Based View of Strategic Integration Between Business and IT

which provide opportunities for "collecting learning" [107, p. 341]. They enable the sharing of experiences, opinions, and viewpoints through conversations [3], brainstorming sessions [29], and confrontations [107].

The importance of the above behaviors in facilitating business–IT alignment is evident in recommendations regarding the participation of business managers during IT planning [25, 32], the development of line managers and IT partnerships [36], and the involvement of the IT managers in business planning [55, 103]. Indeed, "information technology management can be conceptualized as coordinating the relationship between the business domain and the IT domain" [80, p. 56]. Interpersonal sharing of information creates benefits by amplifying the new knowledge and provides benefits such as an improved ability to reflect business objectives in IT plans. Thus,

Hypothesis 1a: IT managers' participation in business planning is positively associated with business–IT strategic alignment.

Hypothesis 1b: Business managers' participation in IT planning is positively associated with business–IT strategic alignment.

The importance of *shared domain knowledge* has also been examined in the strategic IT planning literature. Boynton et al. [11] found managerial IT knowledge, represented by the conjunction of IT-related and business-related knowledge exchanged among IT managers and business unit managers, to positively influence the use of IT for operational and strategic activities. Nelson and Cooprider then developed the construct of "shared knowledge," which they defined as "an understanding and appreciation among IT and line managers for the technologies and processes that affect mutual performance" [65, p. 411]. Reich and Benbasat [80, 81] defined the similar construct of "shared domain knowledge" as "the ability of IT and business executives, at a deep level, to understand and be able to participate in the other's key processes and to respect each other's unique contribution and challenges" [81, p. 86]. More recent literature has examined the implications of such shared domain knowledge for attaining alignment [81], rationality in IT planning [78], and IT assimilation [4].

Two dimensions of shared knowledge or shared domain knowledge have been identified in the prior literature—IT executives' knowledge of business and business executives' knowledge of IT [78]. Vitale et al. [101] described the lack of *top managers' knowledge of IT* as a major inhibitor of effective IT strategies. Since then, several other authors have highlighted the importance of top managers' knowledge about IT and its potential effects (e.g., [4, 55, 86]). *IT managers' participation in business planning* has also been emphasized by others. For example, Rockart et al. [82] argued that the IT executives' increased business knowledge facilitates the integration of business and IT capabilities. As Reich and Benbasat point out, shared domain knowledge "refers both to IT-knowledgeable business managers and business-knowledgeable IT managers" [81, p. 84].

Although the prior literature has discussed both top managers' knowledge of IT and IT managers' knowledge of business, top managers' knowledge of IT is more likely to facilitate business–IT knowledge integration. This may be argued on the basis of the prior explanations for why knowledge integration is difficult [3, 63]. Knowledge integration processes require the participants to (1) have the opportunity to integrate their knowledge, (2) expect the knowledge integration to create value, (3) be motivated to participate in the process, and (4) have the ability to combine the different areas of knowledge [63]. Top managers' knowledge of IT, defined above as knowledge of the value and potential of IT, may be expected to facilitate knowledge integration processes and increase business managers' knowledge and participation. Business managers with greater awareness and appreciation of IT are likely to create opportunities for business–IT alignment, expect such alignment to add value, be motivated to contribute to the process, and possess the ability to integrate business and IT knowledge.

In contrast to the above effect of top managers' knowledge of IT, the effect of IT managers' knowledge of business on processes that will lead to higher alignment is more limited. Although it would aid IT managers in combining their knowledge with that of business managers, it may not directly increase top managers' expectations with respect to IT, or their support for IT projects. Therefore, while recognizing the importance of IT managers' knowledge of business, we exclude it and focus on top managers' knowledge of IT. Another reason for excluding IT managers' knowledge of business is that much of the emphasis on IT managers' knowledge of business is based on arguments concerning IT managers' awareness of the business strategy [55], which is captured in this study to some extent through the items measuring IT managers' participation in business planning.

As can be seen from the above definition of shared domain knowledge, as well as in Nelson and Cooprider's view of shared knowledge as "an understanding and appreciation" [65, p. 411], both awareness and appreciation for IT are important when studying shared domain knowledge. Consequently, some studies have operationalized top managers' knowledge of IT to include their recognition of IT's strategic potential (e.g., [11]) and top managers' perception of IT importance to include their knowledge of IT assets and opportunities (e.g., [98]). Top managers' knowledge of IT is therefore viewed in this paper as their knowledge of IT as well as its potential value.

Consistent with the earlier discussion of the knowledge-based theory of the firm, top managers' knowledge of IT may be expected to facilitate business managers' participation in strategic IT planning as well as IT managers' participation in business planning. Business managers who know about IT and its strategic potential are more likely to communicate with IT managers and involve them in business decisions [54, 81]. Moreover, IT-knowledgeable business managers are more likely to participate during strategic IT planning [40], and less likely to view it as a resource drain [32, 76]. Thus,

> *Hypothesis 2a: Top managers' knowledge of IT is positively associated with IT managers' participation in business planning.*

> *Hypothesis 2b: Top managers' knowledge of IT is positively associated with business managers' participation in strategic IT planning.*

The lower part of Figure 1 summarizes the above knowledge-based view of strategic alignment between business and IT. It shows how the constructs included in this study are related to constructs from the knowledge-based theory of the firm. The relationships hypothesized above are also indicated.

Context of Business–IT Alignment

This paper examines the effects of two variables—organizational emphasis on knowledge management and centralization of IT decisions—on strategic alignment between business and IT. These two variables, and the associated hypotheses, are discussed below.

Organizational Emphasis on Knowledge Management

Organizational knowledge management includes the identification, acquisition, storing, and dissemination of both tacit and explicit knowledge [3, 29]. Organizational emphasis on knowledge management reflects the commitment of top management to knowledge formation and dissemination within the organization. Commitment underlies knowledge-creating activities and signals its importance [66].

Organizational emphasis on knowledge management can improve organizational members' awareness of business initiatives and information technologies, and support the intellectual requirements of IT strategies and projects [96]. Over time, organizational emphasis on knowledge management would facilitate top managers' knowledge of IT through more frequent interactions with IT personnel [81]. Top managers of companies that value knowledge as an asset would more likely be knowledgeable about the capabilities and benefits of IT. Thus,

Hypothesis 3: Organizational emphasis on knowledge management is positively associated with top managers' knowledge of IT.

Centralization of IT Decisions

Centralization has been mentioned as critical for IT executives since the mid-1980s [12]. Centralization of IT decisions refers to the extent to which the IT decisions and responsibilities are made by a central IT group rather than the users [95]. According to Brown and Magill, "a *centralized design* is present when decision authority resides primarily with corporate IT managers [i.e., or other central IT unit]" [14, p. 177; emphasis added]. Centralization has its benefits and drawbacks, which Brown and Magill describe as follows:

> Within the literature there also appears to be general agreement about the primary organizational tradeoffs: centralization affords greater efficiencies [i.e., economies of scale] and standardized controls as well as organizational integration, while decentralization provides local control and ownership of resources as well as greater responsiveness to business unit needs. [13, p. 372]

Thus, greater centralization of IT decisions implies greater organizational integration. It would also lead to the concentration of IT managers, who are likely to have greater interaction with top management [40]. Over time, top managers' knowledge of IT would therefore increase as a result of their greater interactions with IT managers [81]. Centralization is therefore expected to facilitate top managers' knowledge of IT. Thus,

Hypothesis 4: Centralization of IT decisions is positively associated with top managers' knowledge of IT.

Consequences of Business–IT Strategic Alignment

Business–IT strategic alignment derives from the cognitive development of strategies that reflect the combined knowledge of business and IT managers. The goal of knowledge integration, however, is not superior alignment per se but the organizational capabilities that stem from alignment. For IT, a core capability is quality project planning.

For the purposes of this paper, we adopt King's definition of an IT project as "a set of activities that starts and ends at identifiable points in time and that produces quantifiable and qualifiable software deliverables" [51, p. 2]. IT project planning refers to the extent to which timetables, milestones, workforce, equipment, and budget are specified [1, 92]. A necessary condition for achieving project management goals is the development of a timely, realistic, and useful master project plan that considers the project's scope, cost, activity scheduling, and resource requirements and availability [75]. Before beginning an IT project, a detailed planning process needs to be undertaken [1]. Specifying the timeline is an essential aspect of the planning effort [100]. Moreover, the planning process should incorporate the project's needs for personnel and equipment [92]. Therefore, IT project planning should also involve the preparation of a project budget in order to establish the needed funding for the different components [87].

Two constructs related to IT projects are included in this study as mediating the relationship between business–IT strategic alignment and business effects of IT—quality of IT project planning and implementation problems in IT projects. Both quality of IT project planning and implementation problems in IT projects depend on strategic IS planning, and quality of IT project planning might negatively affect implementation problems in IT projects, but the two constructs are distinct [56, 74, 97]. Quality of IT project planning reflects the extent to which IT project planning conforms to recommendations regarding the objectives of project planning [44, 48, 75, 92], and especially IT project planning [1, 22, 39, 47, 88]. By contrast, implementation problems in IT projects reflects the extent to which IT projects encounter problems during implementation due to reasons that may be attributed to inadequate planning for IT at strategic or operational levels [44, 47]. Thus, quality of IT project planning is concerned with the scope, resources, schedules, and plans for IT projects [56, 74], whereas implementation problems in IT projects reflects the difficulties [74, 97] encountered—as well as the absence of potential difficulties avoided due to effective planning—when IT projects are implemented.

Greater business–IT strategic alignment can contribute to increased business effects of IT through both increased quality of IT project planning and reduced implementation problems in IT projects. Greater business–IT strategic alignment, which is an outcome of knowledge integration between business and IT, would improve IT project planning by facilitating more rational IT investments [28], and improving the ability to estimate the resources required for various IT projects [102]. The business–IT knowledge integration implicit in greater strategic alignment would also facilitate the identification of the gap between current and future states of the organization, and the identification and prioritization of IT projects that would help reduce this gap [57], and thereby enable IT project plans to be more tightly integrated with business plans and strategies [97].

Greater business–IT strategic alignment would also reduce implementation problems in IT projects. When business knowledge is closely integrated with IT knowledge, as reflected in greater levels of business–IT strategic alignment, potential barriers to the implementation of IT project plans can be anticipated [97] and communicated [35] in a more timely fashion, thereby reducing the likelihood of encountering implementation problems. Greater business–IT strategic alignment enables business requirements to be more effectively transformed into the appropriate technologies and systems [20]. Conversely, lower business–IT strategic alignment may lead to expensive IT resources being wasted [56]. For example, in a 2002 study of 134 firms, 56 percent of the firms had to write off a failed IT project at an average cost in excess of $8 million; inadequate planning and poor communication between business and IT managers were cited as common problems [79]. Lower business–IT strategic alignment may also cause a lack of communication, which obstructs clarity of scope and diminishes the ability to obtain project resources [102]. Thus, greater business–IT strategic alignment is argued to reduce implementation problems in IT projects [53].

Hypothesis 5a: Business–IT strategic alignment is positively associated with the quality of IT project planning.

Hypothesis 5b: Business–IT strategic alignment is negatively associated with implementation problems in IT projects.

Business effect of IT reflects the extent to which IT contributes to the firm's business performance. Prior research on strategic effect of IT has highlighted the ability of IT to contribute economic value to an organization by lowering the firm's costs or differentiating its products or services [72]. While business effect is driven by organizational contextual factors, learning at the individual level has organizational effects [66]. By integrating the specialized knowledge of business and IT individuals, the organization realizes greater benefits from strategic IT plans that are associated with the influence of IT on organization performance.

IT projects help convert strategic IT plans into tangible products by enabling the development of systems that have business effects. Moreover, IT project planning is a key determinant of IT project success [1, 28]. Consequently, organizations that better plan for IT projects would have a greater likelihood of benefiting from IT and encountering financial success [50]. On the other hand, firms in which IT projects encounter greater planning-related problems would benefit less from IT, due to greater resources being wasted during the IT projects [22, 47] as well as the reduced benefits from the eventually developed systems [1, 39]. These expectations are consistent with prior research indicating that better high-performing businesses place greater emphasis on analytical capabilities and project-oriented management [62]. Thus,

Hypothesis 6a: The quality of IT project planning is positively associated with business effect of IT.

Hypothesis 6b: Implementation problems in IT projects is negatively associated with business effect of IT.

Figure 2 summarizes our research model, including the research constructs and the specific hypotheses proposed above. It may be noted that we have excluded some hypotheses that could have been proposed based on prior empirical research (such as the direct effect of business–IT strategic alignment on business effect of IT, as empirically found by Sabherwal and Chan [84]), because these effects may be explained using indirect paths included in this study but not in prior research (e.g., IT project planning and implementation problems in IT projects, which were not examined by Sabherwal and Chan [84]).

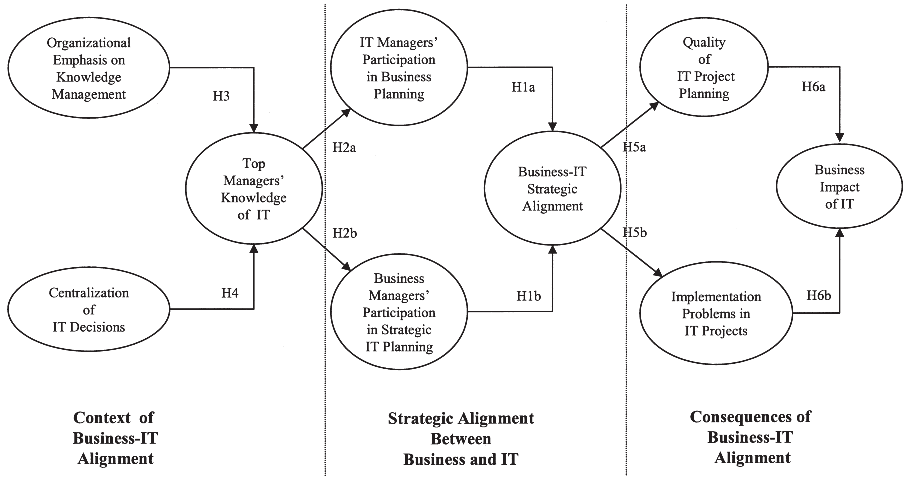

Figure 2. Research Model

The research model reflects outcomes and processes at the organizational and unit or functional levels. The first three constructs of the model represent organizational-level variables that reflect the context in which alignment takes place. The next three constructs are process-oriented variables at the unit level and are followed by two outcome variables at the unit level. Finally, the dependent variable represents organizational-level outcomes resulting from the unit-level processes and outcomes. Thus, it is expected that top management attitudes and knowledge about IT (at the organizational level) will be associated with cross-planning participation (at the unit level), which influences the quality of project planning (at the unit level) and mediates the business effect (at the organizational level).

Research Methods

Context and Procedure

WE TESTED THE RESEARCH HYPOTHESES USING a field survey of medium to large U.S. corporations. The questionnaire was developed based on a comprehensive literature review, with items being adapted from previously tested instruments where available. The questionnaire was first tested using IT professors at a major research university. After incorporating suggested modifications, the revised instrument was evaluated by 20 senior IT managers in the local area. Comments from these managers were used to further refine the questionnaire. Details of the survey items are given in the next subsection.

We considered using multiple respondents from each organization, but decided to use a single informant for two reasons. One major reason was the adverse effect multiple informants per organization would have on sample size. Second, collecting data using multiple informants from each organization has been argued to create potential bias. For example, when answering surveys distributed directly by the chief executive officer (CEO), executives may have doubts that the responses will be truly anonymous. Upward appraisal research reveals that raters are most comfortable when their ratings are anonymous and that subordinates would rate their superiors differently if the process had not been anonymous [105]. Concerns about anonymity of responses on questionnaires passed down directly by the CEO could result in biased responses favorable to what the executive perceives to be the opinion of the CEO.

When using perceptual measures and a single informant, it is necessary to solicit data from the most experienced and knowledgeable person [37]. Cogent arguments have been advanced for using the chief information officer (CIO) as the key informant for questions regarding the use of IT within the organization [24]. Many of the questions that relate to organizational antecedents and consequences of IT processes are best understood by the CIO. We therefore targeted the CIO as the respondent for the survey.

In over 86 percent of the cases, the informant was the CIO but, in other cases, it was a vice president, chief accounting officer, or manager. Perceptions of a single respondent can lead to *common source bias.* To reduce any motivation for exaggeration and self-promotion, respondents were advised that results would be completely anonymous. In addition, we used several questionnaire design strategies that have been recommended [69] to minimize the problems inherent in self-report data: (1) avoid implying that one response is more acceptable than another, (2) make all responses of equal effort, (3) pay attention to item wording, (4) reverse-code some items so that one end of a Likert scale is not always associated with positive outcomes, and (5) avoid socially desirable responses.

Demographic information collected supported the respondents as reliable sources. On average, respondents had 4.7 years of college education, 15.1 years of experience in their industry, 12.5 years of experience in their company, and 17.5 years of experience within the IS area. The average status was 1.7, indicating that they were less than two reporting levels from the CEO. Thus, their experience and exposure to the views of top management provided them with keen insights into the behavior of top and middle (or business) managers and with an understanding of organizational planning.

Questionnaires were mailed to the CIOs of 1,100 companies randomly selected from a mailing list of over 9,000 medium-to-large U.S. companies. The mailing list was derived from multiple sources that included the name and address of the senior IT officer. Phone calls to 50 randomly selected contacts on the list revealed that only seven of the listed names (14 percent) were no longer in that position or with the company. The list was considered satisfactory, considering our objective of gathering a representative random sample from across the United States. To reduce the possibility of single-source bias that might result from exaggeration or self-promotion and to encourage participation, the CIOs were assured that the results would be completely anonymous and that they would receive a summary of study findings.

A total of 204 completed questionnaires were received in the first four weeks following the mailing. Forty-four questionnaires were returned as not deliverable. Phone calls were made to 400 randomly selected nonrespondents. About 90 contacts were made, mostly with secretaries and administrative assistants, and voice messages were left for the others explaining the nature of the survey and requesting a response. Most contacts cited lack of time and company policy regarding confidentiality as reasons for not responding. A second set of questionnaires was sent to the 90 companies who agreed to complete them. After seven weeks, usable responses were available from a total of 269 respondents. Another five questionnaires contained incomplete information and were unusable. This provided an unadjusted response rate of 25 percent, which is considered acceptable when sampling a senior officer [99].

Table 1 shows the frequency of survey response by major industry group. Table 2 provides characteristics of the responding companies. Approximately 70 percent of the companies had annual revenues exceeding $1 billion.

Using the approach suggested by Armstrong and Overton [5], analysis of *nonresponse bias* was performed by comparing early and late responses. Early respondents were those who responded to the initial mailing, while late respondents were those who responded only after a direct appeal and a second questionnaire was sent. *t*-tests of the mean differences for each of the constructs and number of employees failed to reveal any significant differences ($p < 0.05$, two-tailed), suggesting that nonresponse bias was not a problem in this study.

Measures

All the research constructs were measured using closed-end seven-point Likert-scale items, with scales ranging from 1 = "strongly disagree" to 7 = "strongly agree." In total, 44 items were used to measure the nine constructs. These items are given in Appendix A, along with their means and standard deviations and their standardized loadings and *t*-values in the final measurement model. The measures of each research construct are discussed below.

Organizational emphasis on knowledge management (OKM) was measured using five items. Two of these items reflect the organization's attitude toward knowledge (V1) and knowledge management processes (V2) [106]. The other three items (V3–V5) indicate the manifestation of such emphasis on knowledge management within the organization [64]; individuals in an organization that emphasizes knowledge management would have access to the organization's knowledge (V3, V4) as well as to processes for identifying and exploiting the organization's knowledge (V5).

Centralization of IT decisions (CEN) was measured using four items that reflect IT management's control over IT resources. Based on a measure of organizational centralization [61] and research on IT organization structure [13, 14], Ranganathan and Sethi [78] developed a five-item measure for centralization of IT decisions. Four of these items,[2] related to application development, including outsourcing (V6), procurement of hardware and software (V7), staffing IT positions (V8), and procurement and development of infrastructure (V9), were used in this study.

Table 1. Survey Response by Industry

Industry	Frequency	Percent
Manufacturing	112	41.0
Computers/communications	26	9.5
Finance/insurance/legal	25	9.2
Utilities	24	8.8
Wholesale/retail	21	7.7
Oil/petroleum	18	6.6
Health/pharmaceuticals	16	5.9
Transportation	14	5.1
Publishing	8	2.9
Restaurant/entertainment	5	1.8
Missing	4	1.5
Total	273	100.0

Table 2. Characteristics of Respondent Companies

	Frequency	Percent
2001 annual revenue ($ millions)		
> 8,000	53	19.4
> 5,000 to 8,000	26	9.5
> 3,000 to 5,000	36	13.2
> 2,000 to 3,000	29	10.6
> 1,000 to 2,000	51	18.7
> 200 to 1,000	52	19.1
200 or below	24	8.8
Not reported	2	0.7
Total	273	100.0
Total employees		
> 20,000	64	23.4
> 10,000 to 20,000	41	15.0
> 5,000 to 10,000	52	19.1
> 2,000 to 5,000	53	19.4
> 1,000 to 2,000	31	11.4
1,000 or below	28	10.3
Not reported	4	1.5
Total	273	100.0
IT employees		
> 2,000	12	4.4
> 500 to 2,000	28	10.3
> 300 to 500	34	12.5
> 100 to 300	89	32.6
> 50 to 100	51	18.7
50 or below	52	19.0
Not reported	7	2.6
Total	273	100.0

As mentioned earlier, *top managers' knowledge of IT (TMK)* reflects top managers' knowledge of IT and its value to the organization. It was measured using eight items (V10–V17) based on prior literature [4, 11, 78, 98]. Three items are from a prior measure of line managers' knowledge of IT [11] and measure the extent to which these managers recognize IT as a competitive weapon (V10), as a tool to increase the productivity of clerical employees (V11), and as a tool to increase the productivity of professionals (V12). Two other items, measuring top managers' knowledge about the company's IT assets and opportunities (V13) and about the competitors' strategic use of IT (V14), are from a prior measure of shared domain knowledge [78]. The remaining three items, reflecting top managers' recognition of the strategic potential of IT (V15), their beliefs that IT contributes significantly to the firm's financial performance (V16), and that IT projects may have important intangible benefits that should be funded (V17), are based on prior measures of top managers' perception of IT importance [98] and top managers' support for the IT function [38].

IT managers' participation in business planning (ITP) was measured using three items (V18–V20). Two items—measuring the extent to which IT managers regularly attend business meetings (V18) and participate in setting business goals and strategies (V19)—are based on a five-item measure used to evaluate CIOs' participation in business planning [45],[3] whereas the third item (V20) reflects IT managers' early involvement in business projects [55, 78].

Business managers' participation in strategic IT planning (BMP) was measured using a five-item scale based on a prior measure of "planning participation" [91]. Whereas all five items used by Segars et al. mention "IS planning," we focus on IS planning in only two items (V21, V22). In the remaining three items, we explicitly identify tasks related to IT planning—evaluating future business needs (V23), setting IT objectives and strategies (V24), and selecting major IT investments (V25).

Business–IT strategic alignment (ALG) was measured using four items (V26–V29) adapted from Segars and Grover's [90] eight-item measure of "planning alignment." Whereas Segars and Grover used items focusing on activities that facilitate alignment, such as "understanding" and "educating," our measure includes items that assess the level of integration between business and IT, as reflected in IT plans. For example, we asked the informants to assess the extent to which the IT plan aligns with the company's mission, goals, objectives, and strategies (V26). In adapting Segars and Grover's [90] items for this study, we benefited from Reich and Benbasat's [81] discussion of short-term and long-term alignment, Premkumar and King's [73] measure of planning effectiveness, and Kearns and Lederer's [45] measures of the extent to which IT and business plans reflect each other.

The measures for quality of IT project planning and problems in IT project planning were developed on the basis of prior literature on project planning in general [44, 48, 92] and IT project planning in particular [1, 22, 39, 47, 88]. *Quality of IT project planning (QPP)* was measured using five items (V30–V34). Four items are based on a prior measure of project planning [1, 92], and reflect the realistic and achievable estimation of resources (V30), scope (V31), staffing (V32), and timelines (V33). In addition, we included an item related to explicit communication plans (V34) [52, 61].

Five items (V35–V39), based on the above literature, were used to measure *implementation problems in IT projects (PROB).* These items reflect the underlying reasons for project difficulties as reported by Kargar and Blumenthal [44] and Keider [47], including crises distracting attention from implementation (V35), unclear delineation of responsibilities and authorities (V36), unclear statement of overall goals (V37), implementation requiring more time than planned (V38), and a lack of clear communications among participants (V39). The items for the PROB construct were reverse-coded so that high values indicated conditions that were not desirable.

Finally, *business effect of IT (BIT)* was measured using five items (V40–V44). Four of these items are based on a prior measure of IT success [85]. They measure the extent to which IT has contributed to increased market share of products/services (V40), increased sales revenues (V41), creation of systems that are difficult for competitors to imitate (V42), and creation of systems that are significantly different from competitors' (V43). The fifth item (V44) measures the extent to which IT has successfully been used to differentiate the organization's products or services, and was taken from Sabherwal's [83] measure of IT success. These measures reflect strategic outcomes that are the result of major IT projects.

Validation of Measures

To evaluate the appropriateness of the items, a principal components factor analysis was conducted. Based on the criterion of eigenvalue of one or greater, nine factors were produced as expected. Moreover, using varimax rotation, the 44 items loaded onto nine factors in the expected fashion. Each item had a loading above 0.50 on the expected factor, with the lowest primary loading being 0.54. Also, no item had an unexpected secondary loading of 0.50 or above, and there was only one secondary loading above 0.40. Results of this exploratory factor analysis are given in Appendix B.

We next conducted confirmatory factor analysis using structural equation modeling (SEM) [42]. More specifically, we employed EQS version 6 multivariate analytical software, using the maximum likelihood estimation (MLE) method, which allows for the testing of reliability, validity, and measures of fit. The robustness of SEM using MLE has been demonstrated in prior IT research [42, 78, 91]. A measurement model was used to measure the fit between the theorized model and observed data and to establish measures of reliability and convergent and discriminant validity [2, 94].

Several indices were used to assess model fit [7, 9, 10]. One of these is the ratio of χ^2 to degrees of freedom (χ^2/df) [41]. A ratio of below 3 indicates a good fit [16]. We also examined normed fit index (NFI), nonnormed fit index (NNFI), Bollen fit index (BFI), and comparative fit index (CFI). For NFI, values above 0.80 are considered good, whereas for the other indices, values above 0.90 are considered good [59]. Finally, we examined the standardized root mean square residual (SRMSR) and the root mean square error of approximation (RMSEA) [15, 43]. For acceptable fit, SRMSR should be below 0.10, whereas RMSEA should be below 0.08 [59].

The initial measurement model exhibited less than ideal fit, with an NNFI of 0.88, a CFI of 0.89, and a BFI of 0.89. The other fit indices were satisfactory: χ^2/df ratio of

2.23, NFI of 0.82, SRMSR of 0.06, and RMSEA of 0.06. Based on the Lagrange multiplier test, two items (V7 and V25) were dropped to improve fit. Each construct was measured by at least three of the remaining 42 items. Moreover, one observation that had the highest contribution to multivariate kurtosis was dropped, leaving a total of 268 observations. For the final measurement model, CFI, NNFI, and BFI were 0.95 each, NFI was 0.88, the χ^2/df ratio was 1.55, and SRMSR and RMSEA were 0.05 and 0.04, respectively. Thus, the revised measurement model exhibited excellent fit [15].

Each of the nine measures in the final measurement model exhibited satisfactory reliability. Cronbach's alpha coefficients and composite reliabilities, shown in Table 3, all exceed the recommended minimum of 0.70 [31, 68].

Convergent validity, or the degree by which study items measure the underlying latent factor, was established by two tests [2]. First, the standardized factor loadings, which indicate the level of association between the item and the underlying factor, are all high and highly significant. The lowest *t*-value is 9.5 ($p < 0.001$), considerably exceeding the standard of 2.00 [2]. Second, all nine average variance extracted estimates, which measure the variation in the underlying factor relative to random error, equal or exceed the minimum value of 0.50 [31]. These results suggest that the convergent validity of the research variables is adequate.

Discriminant validity, or the degree to which items differentiate between constructs, was assessed using three tests. First, we created confidence intervals of two standard errors above and below each pair-wise correlation. As desired for discriminant validity, this confidence interval does not include 1.0, indicating perfect correlation, for any pair. Second, for each construct, the average variance extracted should exceed the construct's shared variance with every other construct [31]. This is true for every construct, as indicated in Table 3, which provides the average variance extracted (given along the diagonal), the Pearson correlations among constructs (below the diagonal), and shared variances (squared correlations, given above the diagonal). Finally, chi-square difference tests between the unconstrained measurement model and constrained models for each pair of the nine factors indicated that the unconstrained model, in which the factors were distinct but correlated constructs, provide a fit significantly better ($p < 0.001$) than the constrained model for each case. Together, these tests support the discriminant validity for the nine constructs.

Because all nine research constructs were measured using items in a questionnaire completed by a single respondent, we next examined whether common method variance is a serious issue. We did this using Harman's one-factor test [71]. The underlying logic for this test is that if common method bias accounts for the relations among variables, then a factor analysis should yield a single factor when all the items are analyzed together. We conducted Harman's one-factor test in three different ways. First, the 44 items measuring all nine constructs were entered into an exploratory factor analysis, and the results of the unrotated factor solution were examined. If substantial common method variance is present, either a single factor would emerge or one general factor would account for most of the variance [71]. The first factor explained 28.10 percent of the variance, and no general factor was apparent in the

Table 3. Reliabilities, Pearson Correlation Coefficients, and Average Variance Extracted

	Composite reliability	Cronbach's alpha	OKM	CEN	TMK	ITP	BMP	ALN	QPP	PROB	BIT
Organizational emphasis on knowledge management (OKM)	0.84	0.80	**0.51**	0.08	0.36	0.07	0.01	0.05	0.27	0.00	0.31
Centralization of IT decisions (CEN)	0.93	0.93	0.28***	**0.77**	0.31	0.16	0.07	0.18	0.14	0.02	0.18
Top managers' knowledge of IT (TMK)	0.94	0.91	0.60***	0.56***	**0.84**	0.23	0.04	0.17	0.45	0.00	0.32
IT managers' participation in business planning (ITP)	0.75	0.75	0.26***	0.40***	0.48***	**0.50**	0.04	0.22	0.14	0.03	0.10
Business managers' participation in strategic IT planning (BMP)	0.89	0.84	0.11	0.27**	0.20**	0.21**	**0.64**	0.08	0.05	0.07	0.06
Business–IT strategic alignment (ALN)	0.92	0.93	0.23***	0.43***	0.41***	0.47***	0.28***	**0.73**	0.11	0.03	0.13
Quality of IT project planning (QPP)	0.93	0.93	0.52***	0.37***	0.67***	0.38***	0.22**	0.33***	**0.74**	0.01	0.42
Implementation problems in IT projects (PROB)	0.90	0.90	0.03	–0.13*	–0.03	–0.18**	–0.26**	–0.17**	–0.10	**0.65**	0.02
Business effect of IT (BIT)	0.94	0.92	56***	43***	0.57***	0.32***	0.25***	0.36***	0.65***	–0.13*	**0.63**

Notes: Pearson correlations are given below the diagonal, squared correlations are given above the diagonal. *, **, *** represent significance levels of 0.05, 0.01, and 0.001, respectively. Average variance extracted is given in boldface along the diagonal.

unrotated factor solution [89]. In the second test of common method variance, we used confirmatory factor analysis and included the 44 items, the nine latent constructs, and a tenth construct that was linked to all 44 items. The extracted variance for this common latent construct was 25 percent, further indicating that common method variance was not a major problem in this study. Finally, we used a confirmatory factor analysis approach to test a model positing that a single factor underlies the study variables, by linking all 44 items to a single factor for common method variance [60]. This model did not fit the data well at all (χ^2/df = 10.11; NFI = 0.36; NNFI = 0.38; CFI = 0.38; SRMSR = 0.36; and RMSEA = 0.19), and exhibited a much poorer fit as compared to the initial as well as final measurement models. Thus, the results of none of the three tests suggest the presence of common method bias.

Analysis and Results

FOLLOWING THE TWO-PHASE SEM APPROACH outlined by Anderson and Gerbing [2], the measurement model results were used to create a structural model, including paths representing the hypothesized associations among research constructs.

The initial structural model included two latent exogenous variables (organizational emphasis on knowledge management and centralization of IT decisions), seven latent exogenous variables representing the remaining research constructs, and the hypothesized direct paths. All other paths among the latent variables were fixed to zero.

All the hypothesized direct paths in the initial structural model were significant ($p < 0.05$). In the final structural model, shown in Figure 3, all ten paths are significant ($p < 0.01$ or $p < 0.001$). Moreover, this model had excellent overall fit (χ^2/df = 1.60; NFI = 0.87; NNFI = 0.94; CFI = 0.95; SRMSR = 0.08; and RMSEA = 0.04) and did not seem to exclude any statistically important path, as indicated by Wald tests. The overall fit measures, individual parameter estimates, corresponding *t*-statistics, and Wald tests all support the structural model as a reasonable representation of the causal structure underlying the comprehensive, knowledge-based view of IT planning. Thus, the initial research model best fits the data.

Discussion

THIS PAPER STARTED WITH THE BASIC OBJECTIVE of providing insights into the business–IT strategic alignment and its effects on the business effect of IT. Two specific research questions were pursued: (1) Based on knowledge considerations, how do planning behaviors (specifically, IT managers' participation in business planning and business managers' participation in IT planning) and top management knowledge of IT mediate the effects of two contextual factors—organizational emphasis on knowledge management and centralization of IT decisions—on business–IT strategic alignment? (2) How do aspects of IT projects (specifically, quality of IT project planning and implementation problems in IT projects) mediate the relationship between busi-

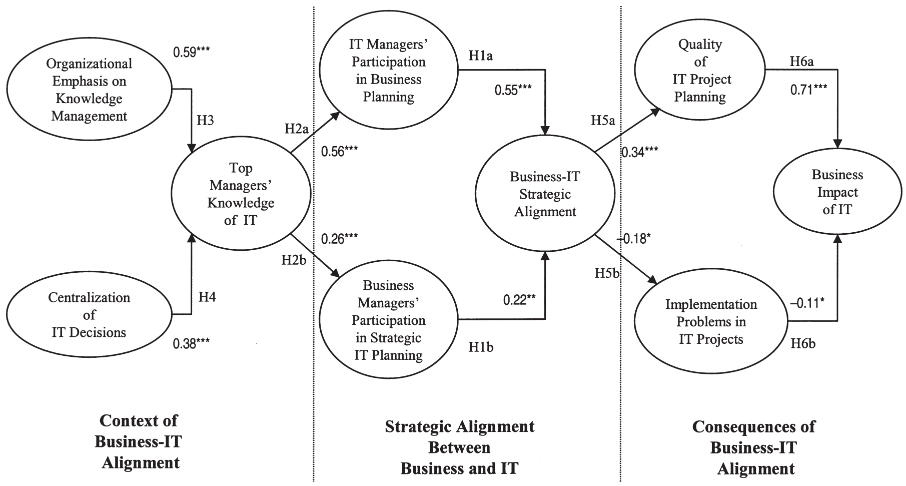

Figure 3. Final Structural Model
Notes: Fit indicators: NFI = 0.87, NNFI = 0.94, CFI = 0.95, SRMSR = 0.08, RMSEA = 0.04. *, **, and *** indicate significance at 0.01, 0.001, and 0.0001 levels, respectively.

ness–IT strategic alignment and business effects of IT? Hypotheses related to these research questions were tested using survey data from 274 CIOs.

Support for Hypotheses

The first research question was pursued by drawing upon the knowledge-based theory of the firm [33, 34, 52, 93] to develop a model testing the relationships among two contextual factors (organizational emphasis on knowledge integration and centralization of IT decisions) on top managers' knowledge of IT, IT managers' participation in business planning, business managers' participation in strategic IT planning, and business–IT alignment.

The empirical results support all the hypotheses related to the first research question. Consistent with research by Reich and Benbasat [81], business–IT alignment is affected by IT managers' participation in business planning (H1a) and business managers' participation in strategic IT planning (H1b), which are both influenced by top managers' knowledge of IT (H2a and H2b, respectively). Organizational emphasis on knowledge integration and centralization of IT decisions influence top managers' knowledge of IT, as posited in H3 and H4, respectively. Moreover, the test of the structural model did not indicate the need to include any of the excluded paths. Thus, the results related to the first question support the relevant hypotheses as well as the exclusion of some relationships that may be explained through indirect paths.

Results related to the second research question—concerning the mediating role of IT project planning in the relationship between business–IT strategic alignment and business effect of IT—also supported the hypothesized relationships. We found business–IT strategic alignment to be positively associated with quality of IT planning and negatively associated with implementation problems in IT projects, as posited in H5a and H5b, respectively. We also found quality of IT planning to positively affect, and implementation problems in IT projects to negatively affect, business effect of IT, as posited in H6a and H6b, respectively. These results indicate that strategic alignment may be important to organizational performance because it leads to higher-quality IT planning and fewer planning-related difficulties in IT projects. Both of the planning constructs were operationalized using measures for "major IT projects" in order to assess the influence of strategic-level projects on organizational performance. Such projects would more likely receive the attention of business managers and be scrutinized by top managers. They would thus benefit directly from strategic alignment and indirectly from top managers' knowledge of IT and indirectly from a positive IT context.

The path coefficients for the paths from business–IT alignment to implementation problems in IT plans ($\beta = -0.18$) and from implementation problems in IT plans to business effect of IT ($\beta = -0.11$) are statistically significant but low, and planning-related difficulties play a minor role as a mediating variable. A possible explanation is that knowledge integration and quality plans have mitigated the effect of these difficulties whereby obstacles are more quickly addressed via a shared understanding of project goals and requirements.

Alternative Model

An alternative model was tested in which a path was added from strategic alignment (ALN) to business effect of IT (BIT). The direct association of ALN → BIT was found to be positive and significant ($\beta = 0.15$, $p < 0.05$) but lower than the paths ALN → QPP ($\beta = 0.34$, $p < 0.001$) and QPP → BIT ($\beta = 0.66$, $p < 0.001$). Thus, quality project plans appear to be an important mediator variable between strategic alignment and business effect of IT. One plausible explanation is that, as knowledge-based theory predicts, the production and utilization of shared knowledge imparts a higher understanding of how IT can support business objectives. Another view is that managers' heightened absorptive capacity enhances the quality of IT project planning to a level that increases the realization of project benefits that are then translated into business effects.

Limitations

There are several limitations to the study. One major limitation of the study is its reliance on a single informant and perceptual data. The use of a single informant was necessitated by sample size considerations, but we tried to reduce its effect by using senior IT executives–who are best positioned to answer the questions–as informants and by designing the questionnaire to mitigate self-reporting bias. Still, responses to items measuring *top managers' knowledge of IT* and *business managers' participa-*

tion in strategic IT planning might be different if answered by another member of senior management.

A second limitation is that the study excluded environmental factors that might be potential antecedents to IT planning sophistication, for example, unique industry characteristics, changes in regulatory environment, and political changes. In order to focus the scope of the study on aspects that were considered more important, we included only two contextual variables—organizational emphasis on knowledge management and centralization of the IT function. These factors may be characterized as "foundation factors" (i.e., "factors that exist by virtue of the firm's infrastructure and that have evolved over time" [49, p. 33]). Nevertheless, the effects of other factors, including environmental uncertainty, were not studied.

Another limitation of the study relates to the conceptualization of centralization of IT decisions. It was viewed as a single construct, implicitly assuming that IT development, operations, and administration decisions have similar levels of centralization. This simplifying assumption was made to keep the study manageable, but different IT activities may be centralized to varying extents [95].

Finally, the use of cross-sectional data precluded an investigation of the potential effect of the dependent variable upon antecedents. For example, business effect of IT and business managers' participation in strategic IT planning could, over time, increase top managers' knowledge of IT.

Implications for Practice

Despite the limitations, we believe that the study has some potentially interesting implications. First, the results indicate that CIOs feel that top management can influence the production of organizational knowledge by affecting the integration process. Top managers' knowledge of IT has major effects on strategic business–IT alignment through planning behaviors, and subsequently on business effect of IT, through the effects on IT projects. Top managers should acquire more IT knowledge and familiarize themselves with ways in which IT can benefit the firm, because such knowledge has far-reaching consequences, eventually increasing business effects of IT. Information about the latest developments in IT is readily available and can be easily acquired. Regular meetings with the CIO and other IT managers would provide insight into the technical perspectives, whereas meetings with business managers would assist in understanding how the firm and its competitors are currently using IT and in uncovering potential ways to further leverage IT as a core competency.

Second, the results enhance our understanding of why business–IT strategic alignment is important to business effect of IT. The results provide insights into how business–IT strategic alignment enables greater business effect by identifying quality of IT plans and implementation problems in IT projects as key mediating variables. Apparently, business–IT strategic alignment enables improved IT project planning and also proves useful in preventing or quickly addressing problems in IT projects. Managers who want to improve IT planning often focus on strategic IT plans, but our results indicate the importance of IT project planning as well as identifying and preventing or minimizing potential problems in the implementation of IT projects.

Third, the results provide fresh insights into how internal context affects knowledge integration. Centralization of IT decisions and emphasis on knowledge management are important antecedents to top managers' knowledge of IT and, as such, are significant to the integration of business and IT. The top managers who would be likely to have greater knowledge of IT when IT decisions are centralized and organizational emphasis on knowledge management is high, however, are also the ones charged with the management of these contextual factors. Thus, if top managers move IT management toward a more centralized structure, and place greater emphasis on knowledge management, they—and other senior managers—would gain greater knowledge of IT, which would eventually lead to greater alignment and increased business effects of IT. In contrast, in the absence of top managers' support, the integration of business and IT knowledge would be based on random occurrences and the willingness of individual managers to interact.

Finally, the results highlight the role of senior management in knowledge management as well as strategic management of IT. Top managers' knowledge of IT is perceived to facilitate not only the contextual factors and the strategic-level planning behaviors but also IT project planning, thus leading the organization through a path that eventually produces actual strategic effects. In the absence of knowledgeable management, it is important that IT executives try to educate top business executives about IT and convince them of its strategic potential. Thus, even in the arena of planning and knowledge management, the value of politics and persuasion cannot be overemphasized [27, 52].

Implications for Future Research

This study also has several implications for future research. First, this paper theoretically and empirically links knowledge considerations to strategic alignment and business effects of IT. The left side of the research model (the proposed model in Figure 2, as well as the emergent model in Figure 3) includes the contextual factors that are hypothesized to create knowledge integration and consequently the planning behaviors that facilitate knowledge sharing. Results show strong associations between the contextual factors and knowledge integration. Thus, our model contributes to knowledge-based theory by showing how contextual factors can affect shared domain knowledge (top managers' knowledge of IT) and how the shared domain knowledge can enable the knowledge sharing behaviors (i.e., business managers' participation in IT planning and IT managers' participation in business planning) that lead to knowledge integration (i.e., business–IT strategic alignment), and subsequently improved business effect of IT. Vitale et al. [101] noted that top managements' lack of IT knowledge can inhibit strategic alignment while Luftman and Brier [57] noted that strategic alignment benefits from top managers' increased IT knowledge. This paper shows how top managers' knowledge of IT affects strategic alignment by supporting the sharing of domain knowledge. Overall, our results support the long-term effects of knowledge integration on business effect of IT.

Second, this paper shows the value of adopting a knowledge-based view to understand the effect of context and planning behaviors on business–IT strategic alignment. Along with the results for the hypotheses related to the first research question, the empirical support for the discriminant validity of the research constructs highlights the benefits of adopting a knowledge-based view of business–IT strategic alignment, which helps delineate the context of the alignment, the relevant shared domain knowledge, the mechanisms or planning behaviors that lead to the alignment, and the outcome of the alignment. Future research would benefit from distinguishing among these aspects, which have sometimes been combined into the same construct, such as "IT planning sophistication" [83].

Third, this paper supports the value of business–IT strategic alignment, which is widely assumed to be critical to IT success, but also highlights the mediating roles of IT project planning and implementation problems in IT projects. The results indicate that these two aspects of IT projects affect business effect of IT, and mediate the relationship between business–IT strategic alignment and business effect of IT. The results also indicate that business–IT knowledge integration not only enables business–IT strategic alignment but it also indirectly facilitates IT project planning and helps reduce problems in IT projects. While it might be argued that the dependent variable should be measured at the project level rather than the organizational level, the business effect of major IT projects is well documented, and so are the related difficulties associated with implementation. Thus, it is logical to assume that these associations exist and are measurable. At a more macro level, these results highlight the value of incorporating aspects of IT projects in research on strategic IT management.

Further research is needed to examine these results and investigate whether they are reproduced using other methods and in other contexts. Moreover, it is important to study other important constructs that might facilitate or inhibit business–IT knowledge integration. These include knowledge hoarding, self-interests, individual capabilities, inertia, social attachments, governance and reward mechanisms, and organizational size and structure. Further research is needed to examine how these aspects affect the integration of business and IT knowledge, and subsequently influence business effects of IT.

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Notes

1. Knowledge integration processes might involve the sharing of explicit or tacit knowledge, or only the transfer of directions or instructions without sharing the underlying knowledge [33, 34].

2. The fifth item from Ranganathan and Sethi's [78] measure (capital budgeting decisions related to IT) was excluded, as it overlaps with IT project planning.

3. Three of Kearns and Lederer's [45] five items—reflecting ease, frequency, and informality of contacts between CIO and CEO—were excluded because they do not directly reflect IT managers' participation in strategic planning.

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Appendix A. Measurement Items

Item	Measure	Mean	Standard deviation	Standard load	t
Organizational emphasis on knowledge management (OKM)					
V1	Knowledge and intellectual capital are viewed as key organizational assets.	4.91	1.60	0.57	9.5
V2	We invest heavily in the capture, assimilation, and dissemination of knowledge.	4.98	1.48	0.80	13.4
V3	We have ready access to expert knowledge within the organization.	5.50	1.38	0.64	11.0
V4	Organizational knowledge is codified and made available to all workers.	4.93	1.59	0.67	10.4
V5	We have processes for identifying and exploiting our knowledge stocks.	4.85	1.62	0.64	9.9
Centralization of IT decisions (CEN)					
	IT decision-making responsibilities are centralized . . .				
V6	for application development including outsourcing.	5.99	1.22	0.82	11.5
V7	for procurement of hardware and software.	5.81	1.04	—	—
V8	for staffing IT positions.	5.95	1.24	0.95	13.4
V9	for procurement and development of infrastructure.	5.91	1.25	0.95	23.1
Top managers' knowledge of IT (TMK)					
	In our company, top managers . . .				
V10	recognize IT as a competitive weapon.	5.27	1.33	0.94	20.3
V11	recognize IT as a tool to increase the productivity of clerical employees.	5.35	1.27	0.98	22.0
V12	recognize IT as a tool to increase the productivity of professionals.	5.37	1.25	0.81	15.8
V13	are knowledgeable about the company's IT assets and opportunities.	5.59	1.30	0.93	20.1
V14	are familiar with competitors' strategic use of IT.	5.27	0.83	0.81	13.9
V15	recognize the strategic potential of IT.	5.43	0.72	0.76	13.8
V16	believe IT contributes significantly to the firm's financial performance.	5.16	1.37	0.77	14.8
V17	agree IT projects may have important intangible benefits that should be funded.	5.23	1.38	0.80	15.8

(continues)

Item	Measure	Mean	Standard deviation	Standard load	t
IT managers' participation in business planning (ITP)					
V18	IT managers regularly attend business meetings.	5.45	0.93	0.79	15.8
V19	IT managers participate in setting business goals and strategies.	4.31	1.49	0.71	11.9
V20	IT managers are involved early in meetings for major projects.	5.40	1.25	0.72	12.0
Business managers' participation in strategic IT planning (BMP)					
V21	A variety of business managers are actively involved in the process of IS planning.	4.51	1.14	—	—
V22	The level of participation in IS planning by diverse interests of the organization is high.	4.71	1.17	0.78	15.9
V23	IT planning involves an evaluation of future information needs of business managers.	5.49	.98	0.60	10.4
V24	A variety of business managers participate in setting IS objectives and strategies.	5.46	.90	0.91	17.8
V25	Business managers from several areas are involved in the selection of major IT investments.	5.26	1.26	0.51	11.1
Business–IT strategic alignment (ALN)					
V26	The IT plan aligns with the company's mission, goals, objectives, and strategies.	5.94	0.98	0.95	16.9
V27	The IT plan contains quantified goals and objectives.	5.68	0.98	0.73	11.8
V28	The IT plan contains detailed action plans/strategies that support company direction.	5.49	1.05	0.65	13.3
V29	We prioritize major IT investments by the expected impact on business performance.	4.83	1.31	0.82	16.3
Quality of IT project planning (QPP)					
	Our major IT projects . . .				
V30	have realistic and achievable resource estimates.	4.46	1.77	0.87	17.3
V31	have realistic and achievable scope estimates.	4.40	1.74	0.85	17.0
V32	have realistic and effective staffing plans.	4.34	1.83	0.90	18.3
V33	have realistic and achievable timelines.	4.55	1.59	0.72	13.2
V34	have explicit communication plans.	4.53	1.72	0.93	19.1

Implementation problems in IT projects (PROB)					
	We have often experienced difficulty implementing major IT projects because of . . .				
V35	crises that distracted attention away from implementation.	4.10	1.38	0.83	16.6
V36	unclear delineation of responsibilities and authorities.	3.92	1.60	0.94	19.5
V37	unclear statement of overall goals.	3.76	1.60	0.96	17.9
V38	implementation requiring more time than planned.	4.59	1.48	0.62	12.2
V39	a lack of clear communications among participants.	3.98	1.38	0.72	13.0
Business effect of IT (BIT)					
V40	IT has contributed significantly to increased market share of products/services.	4.95	1.03	0.72	12.4
V41	IT has contributed significantly to increased sales revenues.	3.64	1.84	0.88	17.8
V42	IT has successfully been used to create systems that are difficult for competitors to imitate.	4.39	1.99	0.74	13.8
V43	IT has successfully been used to create systems that are significantly different from our competitors'.	4.20	1.79	0.86	17.2
V44	IT has successfully been used to differentiate our products or services.	4.63	1.82	0.78	14.6

Notes: All 44 items used to measure the nine research constructs are given in this Appendix. The standardized loadings and the associated *t*-values are from the results for the final measurement model, and are therefore not given for V7 and V21, which were dropped during analysis.

Appendix B. Rotated Component Matrix for the Initial Set of Items

	F1	F2	F3	F4	F5	F6	F7	F8	F9
V1	0.64								
V2	0.54		0.46						
V3	0.74								
V4	0.63								
V5	0.59								
V6		0.85							
V7		0.69							
V8		0.84							
V9		0.77							
V10			0.83						
V11			0.87						
V12			0.69						
V13			0.83						
V14			0.67						
V15			0.73						
V16			0.72						
V17			0.73						
V18				0.74					
V19				0.72					
V20				0.62					
V21					0.77				
V22					0.80				
V23					0.80				
V24					0.72				
V25					0.72				
V26						0.84			
V27						0.86			
V28						0.87			
V29						0.79			
V30							0.77		
V31							0.82		
V32							0.76		
V33							0.65		
V34							0.68		
V35								0.85	
V36								0.89	
V37								0.87	
V38								0.77	
V39								0.79	
V40									0.79
V41									0.73
V42									0.74
V43									0.76
V44									0.75

Only values of 0.4 or higher are reported.